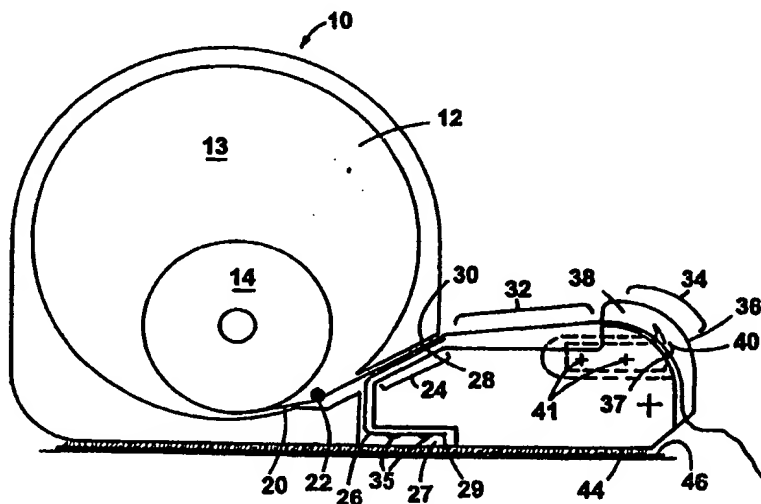




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(21) International Application Number: PCT/US99/17293 (22) International Filing Date: 29 July 1999 (29.07.99) (30) Priority Data: 09/133,991 14 August 1998 (14.08.98) US (63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application US 09/133,991 (CON) Filed on 14 August 1998 (14.08.98) (71) Applicant (for all designated States except US): VELCRO INDUSTRIES B.V. [NL/NL]; Castorweg 22-24, Curacao (AN). (72) Inventor; and (75) Inventor/Applicant (for US only): SHEPARD, William, H. [US/US]; Seven Highland Drive, Amherst, NH 03031 (US). (74) Agent: BABINEAU, James, W.; Fish & Richardson P.C., 225 Franklin Street, Boston, MA 02110-2804 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published With international search report.	

(54) Title: DISPENSING FASTENER STRAPS



## (57) Abstract

A fastener strap dispenser (10, 200, 300) has a housing (11, 202) defining a receptacle (12, 204) and an outlet (32, 227), a length of fastener tape (14, 206) disposed within the receptacle and arranged to be dispensed through the outlet, and a detent (40, 246). The tape has a strip-form base (82) having two broad, opposite surfaces (81, 83), with an array of fastener elements extending from one of the surfaces (82). The base defines tear regions (50) of reduced tear strength formed at spaced intervals along the length, the spaced intervals define individual fastener straps and each fastener strap defines an associated, engageable formation (52, 52'). The detent engages the formation of a trailing strap as a leading strap is pulled through the outlet, acting to resist movement of the trailing strap so that the leading strap parts from the trailing strap at a tear region when a sufficient parting tension is applied to the leading strap.

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## DISPENSING FASTENER STRAPS

### Background of the Invention

This invention relates to fastener strap  
5 dispensers, to methods of making and using such  
dispensers, and to fastener tape suitable for use with  
such dispensers.

Elongated strips of hook and loop fasteners are  
used as straps or ties for bundling and wrapping products  
10 or for applying identification markings to products.

Previously, a continuous strip of fastener tape  
has been provided with cross-perforations or lines of  
weakness spaced at predetermined interval lengths to  
define individual units which can be detached from one  
15 another. In some cases, the tape is wound upon itself to  
form a supply roll. The user manually uncoils a unit  
from the roll, finds the line of weakness, and breaks it  
from the supply roll by tension.

Other items made in continuous sequence as a  
20 continuous strip, to be detached at lines of weakness,  
present similar problems.

### Summary of the Invention

The invention features an improved dispenser for  
dispensing two-sided fastener tape.

25 According to one aspect of the invention, the  
dispenser has a housing defining a receptacle and an  
outlet. A length of fastener tape is disposed within  
the housing and is arranged to be dispensed through the  
outlet. The tape has a strip-form base with two broad,  
30 opposite surfaces, and an array of fastener elements  
extending from one of the surfaces. The base defines  
tear regions of reduced tear strength formed at spaced  
intervals along its length, thus defining individual  
fastener straps between the tear regions. Each fastener  
35 strap defines an associated, engageable formation and the

dispenser has a detent constructed and positioned to engage the formation of a trailing fastener strap as a leading fastener strap is pulled through the outlet. The detent acts to resist movement of the trailing strap so that the leading strap parts from the trailing strap at a tear region when a sufficient parting tension is applied to the leading strap.

In some embodiments, the fastener strap dispenser has a retarder arranged to provide drag against motion of the fastener tape as the leading strap is withdrawn through the outlet. In a particular construction of such an embodiment, the retarder is a resilient member, such as a leaf spring or a spring-loaded roller, that bears against the fastener tape material as the leading strap is withdrawn.

In some particular instances, the detent is a fixed protrusion over which the fastener tape slides and the formations comprise slits defined by the fastener tape. The protrusion is arranged to engage the slit of a trailing strap as a leading strap is pulled from the outlet. In some such instances the resilient member is positioned to bias the fastener tape toward the fixed protrusion as the leading strap is withdrawn from the outlet, so as to aid engagement of the formation of the trailing strap by the fixed protrusion. In some other instances the resilient member is positioned to bias the fastener tape away from the fixed protrusion as the leading strap is withdrawn from the outlet, so as to aid disengagement of the formation of the trailing strap from the fixed protrusion. In some instances the dispenser has a guide channel defined by the housing to position the formations for engagement with the fixed protrusion as the tape is dispensed.

For applications requiring such a feature, in some embodiments the fastener strap dispenser housing has a

mounting boss for permanently mounting the dispenser to a supporting surface.

In some cases the fastener straps used in the dispenser have formations located at the tear regions, while in some other cases the formations of the fastener straps are longitudinally spaced from the tear regions.

In some instances the fastener strap dispenser is proportioned to be hand-held by a user. Preferably, such hand-held dispensers have a total weight of less than about two pounds (0.9 kg), more preferably, less than about 1 pound (0.5 kg). For easy manual manipulation it is preferred that hand-held dispensers have a maximum linear dimension of about 5 inches (127 mm) or less.

In presently preferred embodiments the fastener strap dispenser is used with fastener tape having fastener elements, such as hooks or hook engageable fibers for hook and loop fastening.

In some cases the fastener tape has fastener elements constructed for self-engaging fastening.

In some particularly advantageous constructions, the fastener tape has loops on one broad surface and loop-engageable fastener elements on an opposite broad surface, or has fastener elements on one broad surface and pressure-sensitive adhesive on an opposite broad surface. In some such adhesive-bearing embodiments, the fastener tape also has a release layer extending over the pressure-sensitive adhesive.

Sometimes the fastener tape used in the dispenser is wound in roll form while sometimes the fastener tape is in Z-fold form.

In certain of the hand-held embodiments, the dispenser housing has a curved outer surface to receive an outer surface of an article to be wrapped.

The dispenser has, for some applications, a retarder positioned to resist dispensing of the tape at the outlet. The retarder is manipulable by a user to

provide increased resistance to a trailing fastener strap to facilitate separation of a leading fastener strap from the trailing strap at an associated tear region when a sufficient parting tension is applied to the leading  
5 strap.

In some cases the dispenser has a severing device at the outlet of the housing. The severing device has a sharp edge for cutting through the base of the tape when forced against one of the broad surfaces of the tape.  
10 The severing device may be, for example, an exposed edge of a retarder.

In another aspect of the invention, a length of fastener tape has an elongated strip-form base of uniform width, with two broad, opposite surfaces and tear regions  
15 of reduced tear strength formed at spaced intervals along its length. Individual fastener straps are defined between consecutive tear regions and the strip-form base defines engageable formations for engaging the strip-form base to tear the fastener tape along an associated tear  
20 region. The fastener tape also has an array of fastener elements extending from at least one of the broad surfaces of the base.

In some instances the formations comprise slits extending through the base. In one particular  
25 embodiment, discussed below, the slits are u-shaped and the base and array of fastening elements are a single, unitarily molded structure.

In some instances, the fastening elements of one of the broad surfaces are adapted to engage fastening  
30 elements of the other broad surface. For example, the fastening elements of one broad surface may comprise loops and the fastening elements of the other broad surface may comprise loop-engaging fastener elements.

In another aspect of the invention, a method of  
35 using a dispenser to wrap an article is disclosed.

The dispenser of the present invention provides an efficient mechanism for singulating fastener straps from a supply. Consistent and predictable dispensing of fastener straps, requiring minimal effort on the part of the user to find separation lines of adjacent straps, as provided by the present dispenser, can aid a user in wrapping articles quickly and accurately.

In particular, hand-held embodiments can be useful for dispensing tape as the tape is being wrapped around an article.

#### Brief Description of the Drawings

FIG. 1 is a side view of a dispenser holding a roll of fastener strap material, its cover removed;

FIG. 1A is a front view of the dispenser;

FIG. 1B is a side view of the dispenser similar to FIG. 1, with the cover shown in its position for loading;

FIG. 1C is a side view of the claw included in the dispenser in FIG. 1;

FIG. 1D is a frontal view of the claw shown in FIG. 1C;

FIG. 2 is a diagram of a tensioning system of the dispenser of FIG. 1;

FIG. 2A is a diagram of the tensioning system illustrated in FIG. 2, with an alternatively shaped spring end;

FIG. 2B is a diagram of the tensioning system illustrated in FIG. 2, having a spring with a thinned cross section;

FIG. 3 illustrates a fastener strap being pulled from the dispenser;

FIG. 4, similar to FIG. 3, shows the strap material being engaged by a detent immediately before separation of the leading strap from the roll;

FIG. 5 is a top view of the strap of FIG. 4 being engaged by the detent;

FIG. 6 is a view similar to FIG. 1 of another dispenser construction, with an angled dispenser section, while FIG. 6A is a side view of the cover used with the dispenser of FIG. 6;

5        FIG. 6B is a side view of a dispenser, having three spring rollers to apply pressure to the strap material to be dispensed;

FIG. 6C is a view similar to FIG. 1 of a dispenser construction, having the tensioning system illustrated in  
10 FIG. 2B;

FIG. 7 is a top view of two straps defined by a line of perforations and having a longitudinal slit in adjacent ends;

FIG. 7A is a magnified view of the perforation and  
15 slit of FIG. 7;

FIG. 8 is a top view of two adjacent straps, having another type of formation at their juncture;

FIG. 8A is a magnified view of the features illustrated in FIG. 8;

20        FIG. 8B is a top view of two adjacent straps, having another type of formation at their juncture, with the oval cut formation somewhat displaced from the juncture;

FIG. 8C is a magnified view of the features  
25 illustrated in FIG. 8B;

FIG. 9 is a top view of two adjacent straps, having another type of formation at their juncture;

FIG. 9A is a magnified view of the features illustrated in FIG. 9;

30        FIG. 10 is a longitudinal cross section view of a length of strap material having fastener hooks on one side and loops on the other side;

FIG. 10A is a magnified view of the material of FIG. 10;



FIG. 11 is a longitudinal cross-sectional view of a means for manufacturing an integrally molded engaging member with backing material attached;

FIG. 12 is a variation from FIG. 11, based on the same general principles;

FIG. 13 is a side view of a portable fastener strap dispenser;

FIG. 14 is an enlarged cross-sectional view taken along line 14-14 of FIG. 13;

FIG. 15 shows a side view of the portable dispenser of FIG. 13 being used to wrap fastener strap about a cable bundle;

FIG. 16 shows a front view of the portable dispenser of FIG. 13 being used to wrap fastener strap about a cable bundle;

FIG. 17 is an enlarged side view of the portable dispenser of FIG. 13 with a near side of the front guide channel removed;

FIG. 18 is an end view, as seen from direction 17-17 in Fig. 13, with the strap removed;

FIG. 19 shows a portion of a roll of fastener strap for use with a modified dispenser of FIG. 13;

FIG. 20 shows a portion of a roll of fastener strap for use with a modified dispenser of FIG. 13;

FIG. 21 is a side view of a portable fastener strap dispenser similar to the dispenser of FIG. 13;

FIG. 22 is a side view of a replacement roll of fastener strap for use in the dispenser of FIG. 13 or FIG. 21.

#### Description of Embodiments

Referring to FIGS. 1-6, dispenser 10 has a housing structure that defines supply receptacle 12, which is shaped to loosely hold roll 14 of fastener strap (or other strip form member), to permit rotation of the roll 14.

The receptacle 12 has a back wall 13, and is open at its front to enable loading by axial insertion motion of the roll 14. In FIG. 1B, tape cover 16 of the dispenser, shown in open position, is pivotally mounted to rotate about axis Y to closed position where it locks in place. After the roll 14 is loaded into the dispenser below, cover 16 pivots closed about axis Y, to confine the roll 14.

In one example, receptacle 12 and cover 16 are configured to receive a roll 14 of up to 7.5 inches diameter while in other embodiments the dispenser may be larger or smaller based on user needs. The number of straps in the roll 14 is of course determined by the roll diameter, the wind tension, and the length and thickness of the individual straps. In one embodiment, the dispenser holds a roll of 75 straps, each 18" long by 0.5" wide, the straps having thickness of about .040 inches, forming a roll of about 7.0 inches diameter. The wind tension is sufficient to produce a firm roll which does not easily collapse and cause jamming at the separation pin 22.

The strap material in certain cases is a fastener hook tape or fastener loop tape, each adapted for hook and loop fastening. In the presently preferred embodiment, it is a combination tape having fastener hooks on one side and loops on the other as shown in FIGS. 10 and 10A. As will be described further below, in many applications the hook comprises a plastic strip having an array of fastener hooks molded integrally with the base layer and the loop component is a light-weight, needled, and stretched product that is *in situ* bonded to the base of the hook strip by the adhesive properties of the synthetic resin layer that forms the corresponding side of the base layer. The present embodiment of FIGS. 1-6 is constructed to dispense such two-sided fastener tape.

As shown in FIG. 1 and in detail in FIG. 2, in passing from the supply roll 14 along a removal path, the strap 20 being removed first passes over separation pin 22. Pin 22 extends parallel to axis Z of the supply roll 14, and is located at a height even with support surface 15. The effect of the strap passing under the separation pin, combined with the weight of the roll that resists its vertical movement, serves to break the bond between adjacent hook and loop sides of the strap that is rolled upon itself. Following separation pin 22, the tape 20 passes through a retarding path 24 defined between a flat spring 26 and a land surface 30 defined by the housing structure of the dispenser.

In the embodiment shown, spring 26 is of blue spring steel, flat in orientation. It extends from mount 29 as a cantilever and has an end portion 28 that extends substantially parallel to land 30, against which it is spring biased, such that, in the absence of tape 20, the spring portion 28 engages the land 30. Two screws 35 are perpendicular to the plane of the spring, and go up vertically. Parallel to the right hand side beyond the screw holes 35 is the end of the pocket 27. The depth of the pocket 27 provides enough depth to recess the screw head.

In the presence of the tape, respective faces of the fastener tape are engaged, the spring serving to maintain the emerging part of the strap raised to be grasped and to frictionally retard the tape as the tape is pulled from the dispenser. The moderate predetermined drag provided by the retarding path ensures that the product does not pull out too freely during normal application of withdrawing tension, and it provides resistive tension for enabling the initial phase of the singulating action now to be described.

Following the retarding path, the fastener tape extends freely through access region 32 at which it can

be initially grasped by the user. The tape path then extends through guide channel 34 which is open at the top. Guide channel 34 is defined by two side guide members 36, 37, disposed to be engaged by the edges of the tape, and a downwardly curved lower surface 38 against which the user draws the tape, as the user pulls downwardly and rightward against the resistance provided by the spring which deflects. In this embodiment, one of the guide members 37 is a portion of the structure of the removable cover 16, and the other side guide 36 is integral with the main housing of the dispenser.

Each guide 36, 37 is sufficiently rigid to engage and guide the edges of the strip material which it is adapted to dispense. The two guides 36, 37 thus provide a centering action, to guide the tape so that it registers with a detent device 40 located in the guide channel 34.

In the present embodiment, the detent device 40 is a stationary claw, shaped much like a cat's claw, directed upwardly and hooked backwardly to oppose motion of the strip. The claw tapers slightly to a dull point, which is disposed to be slidably engaged by the underside of the tape as the user, with downward and forward force, draws the tape through the guide channel, against curved surface 38. The tape thus slides over the apex of claw 40. In this embodiment the claw 40 is centered in the middle of the guide channel between the two side plates 36, 37. The shape of the claw is shown in FIGS. 1C and 1D.

In FIG. 1A, a side view of the dispenser (cover 16 shown by dashed lines), the elevation of claw 40 from the body 42 of the claw holder is illustrated. In this embodiment claw 40 is formed integrally with the structural body 42, the claw profile having been provided by a separate piece that is inserted into the body 42. The claw body has mounting holes 41 for attachment.

(In production versions formed by injection molding, the claw is of impact structural resin, e.g. acrylonitrile butadiene styrene (ABS)/or high impact polystyrene, integrally formed with the dispenser housing.)

The detent 40 between the two side plates 36 and 37, rounded as to accommodate sliding movement of the tape 20, stands up and indents the tape as the tape, being drawn by the user from the dispenser, is pulled in rightward, downward motion (FIG. 3), overcoming drag applied to the tape by spring 26. When a formation provided in the strip material at the juncture of the leading strip units and the following units reaches the claw, the claw penetrates the substance of the tape, as shown in FIG. 4 and resists further motion of the following strip unit to the degree that the line of weakness ruptures under user's tension and the leading strip unit is separated from the supply.

As illustrated in FIG. 6B, in order to work with the fastener having tape adhesive on its backside, three spring rollers 17 replace the flat spring 26 and engage the adhesive. The rollers are adjustably spring loaded; drag is provided to the strap by the contact of the non-adhesive side of the product against the body of the dispenser.

FIGS. 6 and 6A illustrate an alternative configuration of the dispenser, where the dispensing section is angled to enable the user to pull strip material straight out of the dispenser at an upwardly inclined angle, when the dispenser is resting on a flat surface.

In another embodiment, shown in FIG. 2A, spring 26 has a curved end. This shape enables the user to smoothly pull a strap out of the dispenser without scratching the strap's surface, and without damaging printing which might be placed on the strap.

Alternatively, the end of the spring 26 can have a thinned cross section, as illustrated in FIG. 6C and in detail in FIG. 2B. The flexibility provided by the thinned section enables the strap to be pulled out of the dispenser without relieving the drag provided by rearward portions of the spring. When pulling tension is discontinued, the end of the spring restores toward its straight configuration, lifting the fastener into position to be grasped.

Referring to FIG. 7, leading and trailing straps A and B are shown with a line of perforations 50 between them, extending from edge to edge of the strap, perpendicular to the longitudinal center axis X of the strap.

The magnified view of FIG. 7A shows a blown-up version of the slit 52 and perforations 50. In this embodiment, the slit is approximately 1/2 inch long, 1/4 inch in each of straps A and B, and is shown centered widthwise and extends perpendicular to the line of perforations 50. The slit and perforations are readily formed with a rotary die system or a stamping system or a laser cutting system through which the strap material is passed before it is formed in rolls.

A longitudinal slit 52 cut through the thickness of the strap is formed in the adjacent end regions of straps A and B at their juncture, this slit being aligned with longitudinal strap axis X.

As Strap A is pulled from the roll 14, it moves across the detent 40, shown in dotted lines. Referring also to FIG. 5, the detent claw is in axial alignment with the center axis X of the strap and slit 52.

As slit 52 approaches the detent 40, the claw feature 40 enters the leading part of slit 50 defined in lead strip A. Hook 40 penetrates the thickness of the tape, and, under downward and rightward tension applied by the user to the lead unit, the tape is free to move

downwardly against the curved surface 38. The strap continues to move from the dispenser until the end of the slit 52, defined by the trailing strap unit B, reaches the claw. The claw resists further movement of the strap and as the lead strap continues to be pulled by the user, the materials breaks at the line of perforations 50, freeing the lead strap unit A from the supply. The spring 26, due to its strength and orientation, raises the portion of the trailing strap unit emerging into region 32, making the unit B available to be grasped. The action of spring 26 pulls strap B from the claw 40.

FIG. 8B illustrates still another tape construction which has a line of perforations 50' similar to those in FIGS. 7 and 8. However, the oval formation 52', which in FIG. 8 is placed directly at the line of perforations, is moved some distance into the strap. This arrangement results in the trailing strap protruding some distance from the dispenser after the leading strap has been severed, making it even more convenient for the user to grasp the next strap.

The length and spring force of the spring 26 is selected to perform its dual function of applying drag as the strap is withdrawn, and of raising the strap material when the preceding strap breaks at the perforations, to position the next strap in a convenient manner for the user to grasp.

Another tape construction, shown in FIG. 8, has a line at perforations 50' similar to those of FIG. 7. However instead of a straight slit, there is an oval cut formation 52'. The oval cut formation provides a benefit in that it helps avoid longitudinal rips in those tape constructions which are susceptible to longitudinal ripping failure. The oval formation 52' serves to spread the load applied by claw 40 to the trailing strap, and thus lessen the stress applied to the trailing strap. The oval formation is advantageous, for instance where

the base layer of fastener hook tape being dispensed is thin and not sufficiently reinforced to prevent propagation of a failure line. A larger oval formation helps keep the tape from catching on the claw.

5       The strap of FIGS. 9 and 9A shows straps, perforations, and cut through similar to those of FIG. 8, with an additional crushed area 54 around the oval, formed by a die that deforms by compression. The crushed or depressed area enables the user to see the beginning  
10 and end of the strap when it is in non-broken form, as it approaches the detent.

For forming the crushed area in a hook or loop fastener tape, a land is provided in the die or stamping tool of about 1/16" width; its pressure crushes all the  
15 features of the hook or the loop and is shaped to cut through on an edge of the crushed region to form the oval cut.

The braking action of the spring which enables tension to be applied on the strip and which prevents  
20 overfeed, enables the mechanism to be used in one-handed operation. For this purpose, the device is attached to a table, or is otherwise secured to resist the tension applied by the user to the dispenser. (In the preferred embodiment shown, hooks 44 are integrally molded in the  
25 base of the dispenser, and the dispenser is packaged with a strip of adhesively backed loop material 46. The loop material is adhered to a bench or other surface, and the dispenser is releasably secured to the loop materials, by resting upon it, with its hooks engaged in the loops.)

30       The side guides 36, 37 provide alignment between the claw feature 40 and the slit feature 52, 52' that have been cut into the straps. The bigger the hole that is slit or punched through the strap, the lower are the alignment requirements. However, a degree of strength is  
35 required so that the straps stay connected until it is necessary that they be broken. As one increases the size



of the feature which the claw 40 engages to hold the strap back, one decreases the available strap width that remains for strength purposes.

In another alternative, an angled slit is provided that extends along the length of e.g. the center half of the tape, so there is a 1/4" on each side, but angled. In this embodiment, the claw feature 40 is able to find it, regardless of the alignment. However, as the height of the claw feature of the detent 40 increases, the stability of the narrow web riding on the top of it without guides becomes less sure. The detent 40 has to be sufficiently high to find the slit; in the case of a diagonal cut, it must extend through sufficiently that the strap cannot ride off it so that it is captured.

The slit or other formation in the strap does not have to be symmetrically disposed or centered so long as the dispenser enables the strap to be guided into engagement with the hook or hooks or other detent.

In another embodiment, the dispenser is manufactured by injection molding techniques as two halves constructed to be releasably joined (or permanently joined with a roll of tape inside with which the dispenser is provided as a disposable unit). One injection molded half, for instance, is constructed to slide over the other half to capture the supply roll.

In a preferred example of such case, the separation pin 22, the land 30, and the claw feature 40 are all injection molded as integral parts of the plastic housing structure.

The spring 26 may be separately formed and inserted into the assembled structure, or it may be injection molded to become integrated with one of the injection molded parts. The spring may for instance be blue spring steel or an impact-resistance plastic.

Referring to FIGS. 10 and 10A, straps A and B are comprised of rows of molded hooks 80, alternate rows

facing in opposite directions. The hooks molded integrally with base layer 82 and the straps have in situ bonded to their lower surface non-woven loop material 84 that forms loops of suitable dimensions to be releasably engaged with hook 80. In a preferred form for use in low cost applications, the non-woven fabric is a needled and stretched loop material described further below.

As illustrated in FIGS. 13-18, hand-held portable dispenser 200 has a housing 202 with a supply receptacle 204 for holding a roll of fastener strap 206. The receptacle 204 has a back wall 208 and is open at its front to enable coaxial loading of the roll over a mounting hub 210.

The roll 206 is free to rotate upon the mounting hub which, as shown in FIG. 14, has a flanged outer edge 212 to help retain the roll on the hub. A user's finger may be inserted through an opening 214 through the mounting hub to aid in winding dispensed fastener strapping 220 around an article to be wrapped.

In use (as shown in FIG. 15 and 16), dispenser 200 is held in one hand and brought to an object to be wrapped (such as the cable bundle 213 shown). The user first pulls the strapping being dispensed 220 up to clear dispenser claw 246 (FIG. 17, discussed below), pulls enough strap out of the dispenser to make one full revolution about the package, and engages the fastener elements 215 of one side of the strap against the loops 217 of the other side of the strap (e.g., at the free end of the strap) to form the first complete "strapping" about the package or bundle. With the once free end of the strap secured to the strap itself, the user may then complete more revolutions of strapping about the package by, for instance, either rolling the bundle (arrow A) or spinning the dispenser (arrow B) about the bundle to dispense more strap.

Alternatively, a user may pull individual straps from dispenser 200, separate them from supply roll 206, and then proceed to wrap the straps about the bundle to be wrapped.

5 As illustrated in FIG. 15, housing 202 has an external surface 216 shaped to fit against the article 213 to be wrapped, so that a user may easily spin the dispenser 200 around the article 213 as the fastener strap 206 is dispensed. Thus, dispenser 200 is  
10 particularly useful for wrapping wire and cable bundles in a helical pattern (FIG. 16).

One of the advantages of using a two-sided fastening strap, as illustrated in FIGS. 15 and 16, is a cushioning effect of the strap against bundle 213  
15 provided by the loop side 217 of the strap. This arrangement helps prevent marring or scratching of sensitive surfaces. Also, wrapped bundle 213 has exposed hook side 215 of dispensed fastening strap 220 for  
20 securing bundle 213 against other surfaces (e.g., to an inner surface of a computer chassis) to keep the bundle in place.

For a given application, such helical bundle wrapping can be performed quickly and efficiently. By pre-determining the diameter of the bundle to be wrapped  
25 and the helix length desired, strap roll 206 can be manufactured having individual straps (e.g., strap "A", strap "B" FIGS. 7-9) of sufficient length to accommodate full revolutions at the beginning and end of the helix to engage the strap to itself while also providing the  
30 predetermined helix length. Perforations and, optionally, formations, can be provided on individual straps to facilitate tearing off individual straps as discussed above.

As shown in FIG. 17, from supply roll 206 a  
35 fastener strap portion being dispensed 220 passes between a flat spring 224 and a land surface 226 of the housing

202 and through dispenser outlet 227 which is defined by the separation of spring 224 and land surface 226 on the side opposite supply roll 206.

Spring 224 is formed of stainless steel (e.g., 1/4 to 1/2 hard spring steel). The spring extends from a mounting base 228 as a cantilever and has an intermediate portion 230 that extends substantially parallel to land surface 226, against which it is biased, such that, in the absence of fastener strap 220, the spring presses against land 226. Two self-tapping screws 232, 233 secure spring 224 to housing 202. Also, spring 224 can be secured to housing 202 by molded plastic features (not shown). In an alternate embodiment, not shown, spring 224 is unitarily molded of the same material as housing 202.

After initial loading of supply roll 206 in dispenser 200, the free end 225 of spring 224 is lifted to allow positioning of strap 220 between spring 224 and land surface 226 so that free end 221 of strap 220 is graspable from dispenser outlet 227. When strap 220 is threaded as shown, opposite faces 221, 223 of the fastener strap 220 are engaged, respectively, by spring 224 and land 226. Thus, strap 220 is frictionally retarded as it is pulled from dispenser 200. The moderate predetermined strap drag provided by spring 224 ensures correct strap tension during dispensing so that the product 206 does not pull out too freely during normal strap application, and it also helps to engage strap 220 upon the detent claw described below.

The strap dispensing path extends through a guide channel 234, as shown in FIG. 17, defined between two side members 236, 237, land surface 226 of housing 202, and spring 224. Outboard of spring 224, surface 226 has a downwardly curved portion 240. Guide members 236, 237 provide a centering action, to guide strap 220 so that it registers with a rigid claw 246 positioned in the guide

channel beyond spring 224. Claw 246 extends from surface 226 and has a distal edge 248 for engaging corresponding notches 52, 52' (FIGS. 7 and 8) of strap 220 as the user draws the strap through the guide channel. Spring 224, while providing strap tension, biases the strap downwardly toward claw 246 to help ensure engagement of the strap and the claw edge. Claw 246 is centered between the guide members, and its shape is shown in FIGS. 16 and 17. The claw 246 is formed integrally with housing 202 in a single molding process.

Separation of a leading strap (e.g., strap "A" FIGS. 7-9) from roll 206 using hand-held dispenser 200 is achieved as in the above described dispenser embodiments, however, in this portable embodiment spring 224 acts downwardly on strap 220. Thus, a user must pull a leading strap upward with enough force to disengage corresponding formation 52, 52' (FIGS. 7-9) from claw 246 to initiate strap dispensing.

Therefore, it is especially advantageous in this embodiment to provide strap supply 206 having strap formations 52, 52' (FIGS. 7-9) some distance from strap perforations 50' (as shown in FIG. 8B-8C) making it more convenient for the user to grasp the next strap to be dispensed.

FIG. 18 shows a supply of strap 306 having perforations 350 but without formations for engaging a detent claw. Such a strap construction can be used with a modified dispenser 200 without a detent claw (i.e. - surface 226 being smooth, continuous). For example, a user can press free end 225 of spring 224 or a finger against the portion of strap 306 being dispensed, forcing that portion of strap 306 against surface 226. In this manner, a user may provide sufficient resistance to a trailing strap (e.g., strap "B" or "C" in FIG. 19) while pulling the free end of a leading strap (e.g., strap "A" in FIG. 19) to separate the leading strap from the

trailing strap along the closest exposed perforation line 350.

FIG. 20 shows a supply of strap 406 without perforations and without formations for engaging a detent  
5 claw. Such a strap construction can be used with the dispenser 300, shown in FIG. 21, having a blade 323 positioned near the outlet for severing the strap 420 being dispensed. Blade 323 has a severing edge 327 and is formed at a downwardly curved free end 325 of spring  
10 324. Severing edge 327 faces flat (e.g., without a claw) surface 326 (FIG. 17). After withdrawing a sufficient length of strap 420 to wrap an article, the user can depress free end 325 of spring 324 toward surface 326 with enough force to sever the strapping with edge 327.  
15 Thus, a user can cut a strap of any desired length depending on the particular wrapping application.

A supply roll 206 suitable for use in portable dispenser 200 is illustrated in FIG. 22. Roll 206 has an inner diameter 250 sufficiently large to fit over  
20 mounting spool 210 and sufficiently small to be retained by mounting spool flange 212. Roll 206 also has an outer diameter 252 limited only by the size of receptacle 204. One example of acceptable roll dimensions is an inner diameter of 1.5 inches and an outer diameter of 3 inches.  
25 With typical strap thickness of .040 inches, as discussed above, these dimensions result in a total strap length of approximately 5 yards. The number of strap units (e.g., strap "A", strap "B", etc. in FIGS. 7-9) per roll 206 will depend on the spacing of perforations 50, 50' (FIGS.  
30 7-9) as discussed above.

The concepts that have been presented have wide application where singulation of a fastener strip product is required. Singulation with one hand is enabled.

Using the hook and loop product from any of the  
35 above discussed embodiments for the dispenser offers advantages of speed: once it is wrapped around the

product, it sticks to itself and is secure.

Identification information can be printed on the hook or loop side of the product.

Another advantageous feature is that the hook and  
5 the loop product can be reused. For instance, if wires, fiber optics or other items should need to be added or removed from the bundle, the strap may be undone, the item added or removed, and the strap re-engaged upon itself. The hook and loop product is not significantly  
10 affected by moisture, cold, oil, grease and other contaminants and maintains good appearance and its action is still secure after multiple openings and closings. Furthermore, by using the dispenser and applying the tape with the loop side in, a cushioning effect is obtained  
15 upon the objects being bundled, preventing abrasion or bruising.

An application is in bundling wires, cables, and hydraulic and pneumatic lines. In the case of telecommunication fiber cables where two-sided hook and  
20 loop products are commonly used, the dispenser, for instance, enables significant reduction of the time necessary to singulate straps.

The dispenser may be employed by packers for household moving, to put tape on boxes, for instance with  
25 pressure-sensitive materials. In one such case a hook tape is provided that has pressure-sensitive adhesive on its back side and perforated as illustrated here, and another tape which is loop that also has pressure-sensitive adhesive, and is perforated in the same way.  
30 Pre-formed pieces of those two fastener components are rolled upon themselves and the rolls mounted in a dual dispenser, side by side, to enable application of each to bags, boxes, etc. to provide a releasable closure system that may be opened and closed repeatedly.

35 This dispenser may be modified in many ways while still employing important features. In one case a spring

lever is advantageously added to the side of the dispenser, associated with an advancing mechanism that is activated by pushing the lever down, to advance the strap. At the time one releases the lever, one would cut  
5 a strap of desired length much like the action of traditional paper tape dispensers. This permits use of the dispenser also with strips that do not have the perforated lines of weakness and other features.

The dispenser can also be automated in which the  
10 pulling tension is applied by e.g. a robot or another device that grasps the free end and draws it from the dispenser as in the manner described.

The dispenser can be used with a variety of fastener strip material, where the strap material has  
15 arrays of fastener elements on both of its sides which are capable of being releasably fastened together. Examples of such elements are hooks and loops. The hooks can be molded integrally with a base layer and the material providing loops including fibers that serve the  
20 function provided by textile loops can be joined by the material of the base layer. The loop side of the material can advantageously be a low-cost non-woven web of entangled fibers of substantial tenacity with a basis weight of between 1.8 to 2.5 ounces per square yard.

25 The loop material can advantageously comprise a batt of loose, staple fibers that have been entangled and form a non-woven fabric of fibers joined at entanglements, with loops of some of the fibers extending from at least one side of the fabric. Advantageously,  
30 needling of the batt is employed to form the entanglements. In some embodiments, the non-woven fabric is bonded in a stretched state in which tightened entanglements form knots. The non-woven fabric can also be bonded in a stretched state by resin integral with the  
35 material that forms the hook-form fastening elements. Non-woven material for forming such fastener elements and



its method of manufacture is more fully described in our co-pending application U.S. Application No. 08/922,292, filed September 3, 1997, entitled FASTENER LOOP MATERIAL, ITS MANUFACTURE, AND PRODUCTS INCORPORATING THE MATERIAL, which is hereby incorporated by reference.

As has previously been indicated with reference to FIGS. 7-10, fastener material suitable for use with the dispenser can be prepared in the form of an extended length of strip material defined as a series of detachable straps. For use with the dispenser detent, the material has formations including weakened parting lines at spaced intervals along its length and at least one formation constructed and arranged to be engaged by the detent to detain the remaining length of fastener material while the leading strip is detached by rupture at the parting line by tension applied to the parting line.

This material is provided with sufficient lateral stiffness to enable it to be guided by edge guides, to register the detent with the formation at the leading end of each strip. Furthermore, it is advantageous that the material have sufficient thickness and stiffness to spring from a bent configuration as it is pulled across the detent to a more planar shape when the leading strip is broken from the remaining material so that the freed end of the remaining material lifts from the detent in a position where it can be readily grasped by a user for dispensing the next successive strip as the new leading strip.

*Adhesive-backed hook or loop with release layer*

Various types of fastener materials having pressure sensitive adhesive on the side opposite the fastening elements are provided with a release layer, and the lines of perforations are made through both the fastener material and the release layer, thereby enabling simultaneous separation of all layers by the dispenser.

*Printing on straps*

For certain applications, it is useful to have text printed on the separable straps, for instance to provide label information such as product codes, bar  
5 codes, identification of bundled elements for telecommunication, instructions or warnings. Such information may be pre-printed on the hook or loop portion of the straps.

*Manufacturing methods*

10 Advantageously following the techniques disclosed in U.S. Patent Application "Fastener Loop Material, Its Manufacture and Products Incorporating the Material", referenced above, a lightweight, non-woven loop material is produced. It comprises a non-woven web of entangled  
15 fibers of substantial tenacity, the fibers forming a sheet-form body and hook-engageable free-standing loops extending from the web body. The web is stretched before bonding to produce spaced apart loop clusters extending from a very thin web of taut fibers, and binder can be  
20 added to stabilize the product in its stretched condition. The backside of the loop product is then combined with the back side of a layer that carries hook fasteners; this combining step can be effective to bind the knots to hold the fabric in its stretched condition,  
25 to serve the function of the binder just mentioned.

This hook-engageable material is then used for forming a composite product having a large multiplicity of hook-form fastener projections extending from the opposite surface. For this purpose a cooled, rotating  
30 mold roller is provided having inwardly extending, fixed, projection-forming cavities defined in its periphery, to the exterior of the forming roller, molten plastic material is applied for filling the cavities and forming a base in the manner that incorporates the hook  
35 engageable material on the side of the base opposite from the side in which the projections are formed, the

fastener material is withdrawn from the forming roller in a step that includes withdrawing the projections from the cavities, and either in line or as a separate batch process, parting lines are formed at spaced intervals  
5 extending transversely of the strip material.

Advantageously the non-woven material is laminated in situ with the hook material using a layer of resin that forms the base of the hook material to bond directly to the non-woven, as generally taught by Kennedy et al.  
10 in U.S. Patent 5,260,015.

In the case of using the specific example of FIG. 2 of the Kennedy et al. patent (FIG. 11 of this application) a pre-formed sheet material 90 is forced into the nip 96 at the same time as molten plastic 93 is  
15 forced into the nip 96 to create strip fastener tape, the sheet material bonding intimately with the fastener to become an integral part of the structure of the strip fastener.

Another case which utilizes the same general  
20 concept, is the specific system illustrated in U.S. Patent No. 5,441,687, Murasaki et al. At the front end surface of the upper half of the extrusion nozzle 1 shown in FIG. 1 of that patent (FIG. 12 of this application), there is an upper arced surface 101a, the curve of which  
25 mirrors that of the die wheel 102, while at the front end surface of the lower half of the nozzle 101, there is a further lower arced surface 101b, the curve of which also mirrors that of the die wheel.

A guide channel 101d through which the non-woven  
30 material is introduced is formed in the lower half of the extrusion nozzle 101. A rear pressure roller 108a applies pressure between the sheet of molten resin extruded from the extrusion nozzle, to join the non-woven material 103 to be attached to the resin.

35 Thus in operation the molten resin extruded from the extrusion nozzle 101 is forced into the gap between

the die wheel 102 and the lower arced surface 101b, and fills up the hook molding cavities 105 along with a base layer 104a of fixed thickness and width. At the same time as this molding process is taking place, the backing material 103 is guided up through the backing material guide channel 101d in the extrusion nozzle 101 and is pressed against the surface of the molten base layer 104a by the rear pressure roller 108a to firmly join them together, so that the bases of the loops in the backing material are firmly held by the resin so that the loops will hold their shape well and will be very durable.

Various preferred embodiments of the invention have been presented. However, the illustrations are not exhaustive; it should be readily apparent to one skilled in the art that other configurations of the dispenser and the strap material are possible, including use of alternative strap material configurations and arrangements within the dispenser.

What is claimed is:

1. A fastener strap dispenser (10, 200, 300) comprising:

a housing (11, 202) defining a receptacle (12, 204) and an outlet (32, 227);

5 a length of fastener tape (14, 206) disposed within the receptacle and arranged to be dispensed through the outlet, the tape comprising a strip-form base (82) having two broad, opposite surfaces (81, 83), an array of fastener elements (80, 84) extending from one of  
10 the surfaces, the base defining tear regions (50) of reduced tear strength formed at spaced intervals along the length defining individual fastener straps therebetween with each fastener strap defining an associated, engageable formation (52, 52'); and

15 a detent (40, 246) constructed and positioned to engage the formation of a trailing one of said straps as a leading one of said straps is pulled through the outlet (32, 227), the detent acting to resist movement of the trailing strap so that the leading strap parts from the  
20 trailing strap at a tear region (50) when a sufficient parting tension is applied to the leading strap.

2. The fastener strap dispenser (10, 200, 300) of claim 1 further comprising a retarder (17, 26, 224) coupled to the housing (11, 202) and arranged to provide  
25 drag against motion of the fastener tape (14, 206) as the leading strap is withdrawn through the outlet (32, 227).

3. The fastener strap dispenser (10, 200, 300) of claim 2 in which the retarder (17, 26, 224) comprises a resilient member (17, 26, 224) that bears against the  
30 fastener tape material (14, 206) as the leading strap is withdrawn.

4. The fastener strap dispenser (10, 200, 300) of claim 3 in which said resilient member (17, 26, 224) is a leaf spring (17, 224).

5. The fastener strap dispenser (10, 200, 300) of claim 3 wherein said resilient member (17, 26, 224) is a spring-loaded roller (26).

6. The fastener strap dispenser (10, 200, 300) of claim 3 wherein the detent (40, 246) comprises a fixed protrusion (40, 246) over which the fastener tape (14, 206) slides and the formations (52, 52') comprise slits defined by the fastener tape, the protrusion arranged to engage the slit of the trailing strap as the leading strap is pulled from the outlet (32, 227).

7. The fastener strap dispenser (10, 200, 300) of claim 6 wherein the resilient member (17, 26, 224) is positioned to bias the fastener tape (14, 206) toward the fixed protrusion (40, 246) as the leading strap is withdrawn from the outlet (32, 227) to aid engagement of the formation (52, 52') of the trailing strap by the fixed protrusion.

8. The fastener strap dispenser (10, 200, 300) of claim 6 wherein the resilient member (17, 26, 224) is positioned to bias the fastener tape (14, 206) away from the fixed protrusion (40, 246) as the leading strap is withdrawn from the outlet (32, 227) to aid disengagement of the formation (52, 52') of the trailing strap from the fixed protrusion.

9. The fastener strap dispenser (10, 200, 300) of Claim 6 wherein the housing (11, 202) defines a guide channel (34, 234) to position the formations (52, 52')

for engagement with the fixed protrusion (40, 246) as the fastener tape (14, 206) is dispensed.

10. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the housing (11, 202) has a mounting  
5 boss (44) for securing the dispenser to a supporting surface.

11. The fastener strap dispenser (10, 200, 300) of claim 1 in which the formations (52, 52') of the fastener straps are located at the tear regions (50).

10 12. The fastener strap dispenser (10, 200, 300) of claim 1 in which the formations (52, 52') of the fastener straps are longitudinally spaced from the tear regions (50).

13. The fastener strap dispenser (10, 200, 300)  
15 of claim 3 wherein the dispenser is proportioned to be hand-held by a user.

14. The fastener strap dispenser (10, 200, 300) of claim 13 having a total weight of less than about one pound (0.5 kg).

20 15. The fastener strap dispenser (10, 200, 300) of claim 14 having a maximum linear dimension of about 5 inches (127 mm).

16. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener elements (80, 84)  
25 comprise hooks (80) for hook and loop fastening.

17. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener elements (80, 84)

comprise fibers (84) adapted to be engaged by hooks for hook and loop fastening.

18. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener elements (80, 84) are  
5 constructed for self-engaging fastening.

19. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener tape (14, 206) has loops (84) on one broad surface (81 or 83) thereof, and loop-engageable fastener elements (80) on an opposite broad  
10 surface (81 or 83) thereof.

20. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener tape (14, 206) has fastener elements (80, 84) on one broad surface (81 or 83) thereof and pressure-sensitive adhesive on an  
15 opposite broad surface (81, 83) thereof.

21. The fastener strap dispenser (10, 200, 300) of claim 20 wherein the fastener tape (14, 206) further comprises a release layer extending over the pressure-sensitive adhesive.

20 22. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener tape (14, 206) is in roll form.

23. The fastener strap dispenser (10, 200, 300) of claim 1 wherein the fastener tape (14, 206) is in Z-  
25 fold form.

24. A fastener strap dispenser (10, 200, 300) comprising:

a graspable housing (11, 202) defining a receptacle (12, 204) and an outlet (32, 227);



a length of fastener tape (14, 206) disposed within the receptacle and arranged to be dispensed through the outlet, the tape comprising a strip-form base (82) having two broad, opposite surfaces (81,83), an array of fastener elements (80, 84) extending from one of the surfaces, the base defining tear regions (50) of reduced tear strength at spaced intervals along the length and defining individual fastening straps therebetween with each fastener strap defining an engageable formation (52, 52');  
10

a fixed protrusion (40, 246) constructed and positioned to engage the formation of a trailing one of said straps as a leading one of said straps is withdrawn through the outlet (32, 227) to resist movement of the trailing strap so that the leading strap parts from the trailing strap at an associated tear region (50) when a sufficient parting tension is applied to the leading strap; and  
15

a retarder (17, 26, 224) coupled to the housing and arranged to provide drag against motion of the fastener tape (14, 206) as the leading strap is withdrawn through the outlet.  
20

25. The fastener strap dispenser (10, 200, 300) of claim 24 having a maximum linear dimension of about 5 inches (127 mm).  
25

26. The fastener strap dispenser (10, 200, 300) of claim 25 having a total weight of less than about one pound (0.5 kg).

27. The fastener strap dispenser (10, 200, 300) of claim 24 wherein the housing has a curved outer surface (216) to receive an outer surface of an article to be wrapped (213).  
30

28. A fastener strap dispenser (10, 200, 300) comprising:

a housing (11, 202) defining a receptacle (12, 204) and an outlet (32, 227);

5 a length of fastener tape (14, 206) disposed within the receptacle and arranged to be dispensed through the outlet, the tape comprising a strip-form base (82) having two broad, opposite surfaces (81, 83), an array of fastener elements (82, 84) extending from one of  
10 the surfaces, the base defining tear regions (50) of reduced tear strength at spaced intervals along the length defining individual fastener straps therebetween; and

a retarder (17, 26, 224) positioned to resist  
15 dispensing of the tape at said outlet, the retarder being manipulable by a user to provide increased resistance to a trailing one of said fastener straps to facilitate separation of a leading one of said fastener straps from the trailing strap at an associated tear region when a  
20 sufficient parting tension is applied to the leading strap.

29. A fastener strap dispenser (300) comprising:

a graspable housing (11, 202) defining a receptacle (12, 204) and an outlet (32, 227), the housing  
25 adapted to be hand-held in use;

a length of fastener tape (14, 206) disposed within the receptacle and arranged to be dispensed through the outlet, the tape comprising a strip-form base (82) having two broad, opposite surfaces (81, 83), an  
30 array of fastener elements (80, 84) extending from one of the surfaces engageable with an array of fastener elements (80, 84) on the opposite broad surface;

a retarder (324) coupled to the housing and arranged to provide drag against motion of the fastener

tape as the leading strap is withdrawn through the outlet; and

a severing device (323) at the outlet of the housing, the severing device having a sharp edge (327) for cutting through the base (82) of the tape when forced against one of the broad surfaces (81, 83) of the tape.

30. The fastener strap dispenser (300) of claim 29 wherein said severing device (323) is an exposed edge of said retarder (324).

10 31. A length of fastener tape (14, 206) comprising:

an elongated strip-form base (82) having a uniform width, two broad, opposite surfaces (81, 83) and tear regions (50) of reduced tear strength formed at spaced intervals along its length, the tear regions defining individual fastener straps therebetween, the strip-form base defining an engageable formation (52, 52') for engaging the strip-form base to tear the fastener tape along an associated tear region; and

20 an array of fastener elements (80, 84) extending from at least one of the broad surfaces of the base.

32. The length of fastener tape (14, 206) of claim 31 wherein the formations (52, 52') comprise slits (52, 52') extending through the base.

25 33. The length of fastener tape (14, 206) of claim 32 wherein the slits (52, 52') are u-shaped (52').

34. The length of fastener tape (14, 206) of claim 31 wherein the base (82) and array of fastening elements (80, 84) are a single, unitarily molded structure.

30

35. The length of fastener tape (14, 206) of claim 31 wherein each of the broad surfaces (81, 83) of the tape have fastening elements (80, 84) extending therefrom, the fastening elements of one of the broad  
5 surfaces being adapted to engage the fastening elements of the other broad surface.

36. The length of fastener tape (14, 206) of claim 35 wherein the fastening elements (80, 84) of one broad surface are loops (84) and the fastening elements  
10 of the other broad surface are loop-engaging fastener elements (80).

37. A method of wrapping an article (213) comprising:

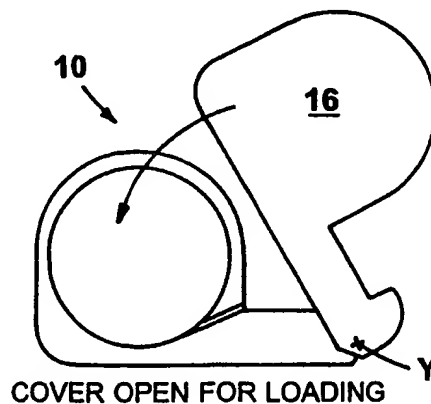
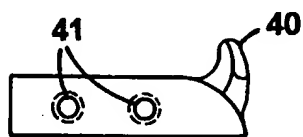
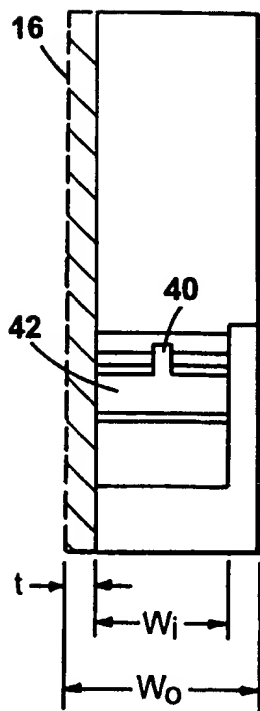
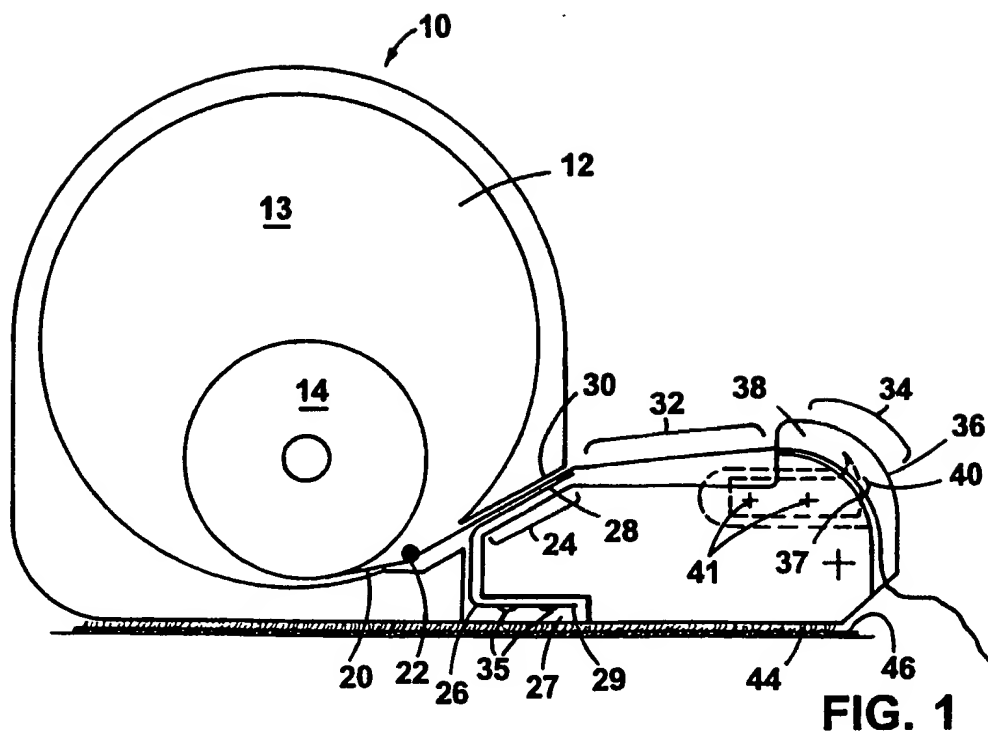
providing the fastener strap dispenser (10, 200,  
15 300) of claim 1;

pulling a free end (221) of a leading fastener strap from the dispenser until the formation (52, 52') of a trailing strap is engaged by the detent (40, 246);

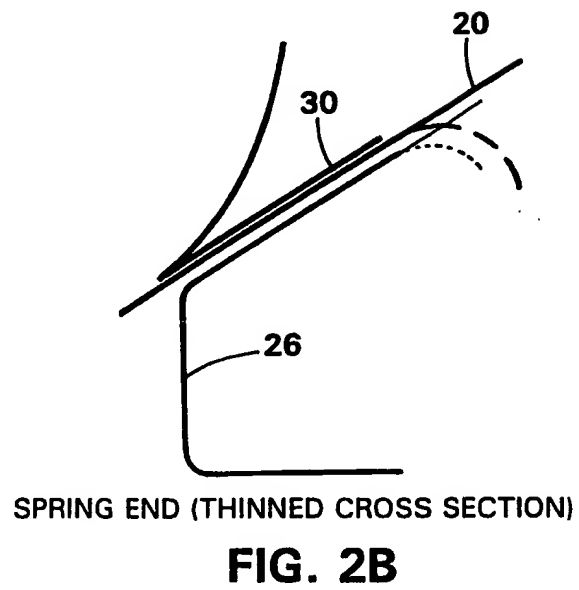
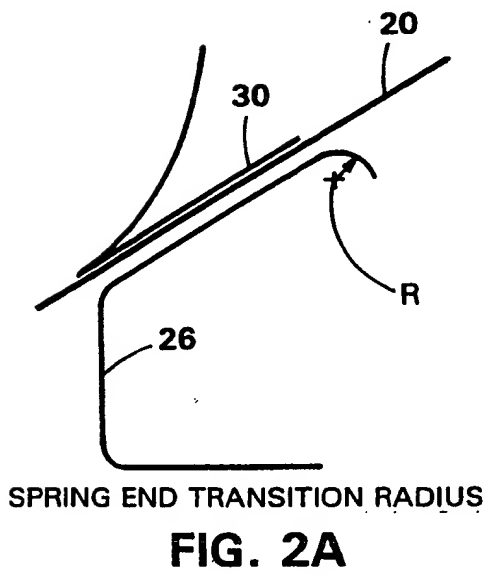
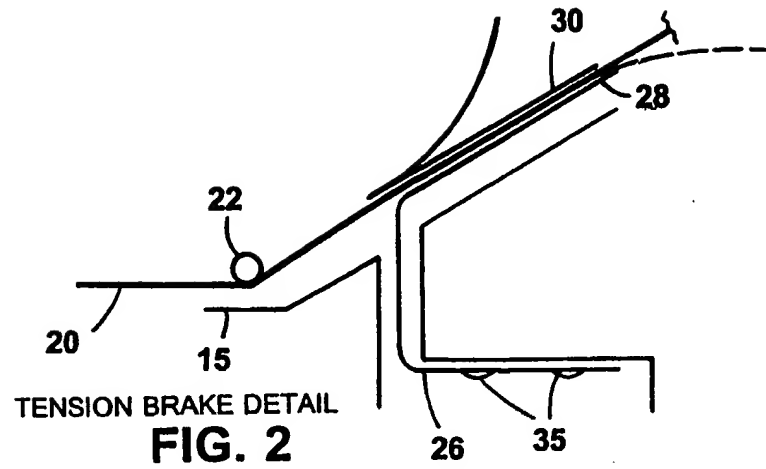
wrapping the leading fastener about the article  
20 (213); and

applying sufficient tension to separate the leading strap from the trailing strap at an exposed tear region (50).

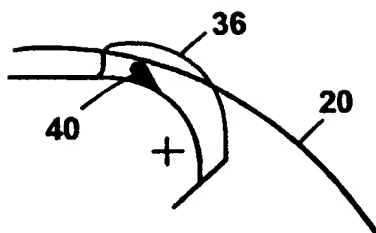
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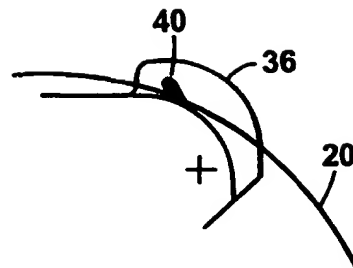


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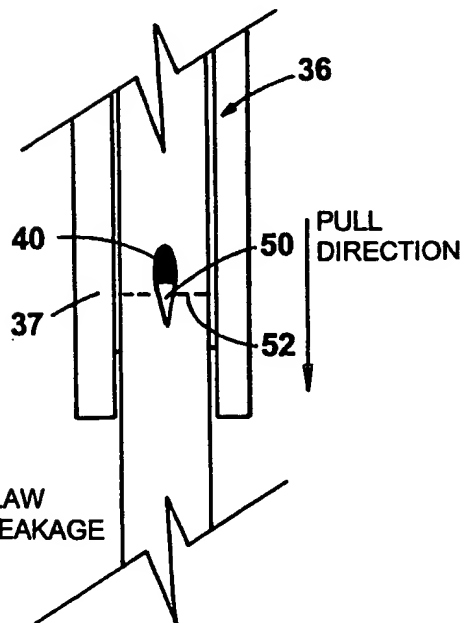
STRAP SLIDING OVER CLAW AS  
STRAP IS BEING DISPENSED

**FIG. 3**



STRAP ENGAGED WITH CLAW  
IMMEDIATELY BEFORE BREAKAGE

**FIG. 4**



TOP VIEW:  
STRAP ENGAGED WITH CLAW  
IMMEDIATELY BEFORE BREAKAGE

**FIG. 5**

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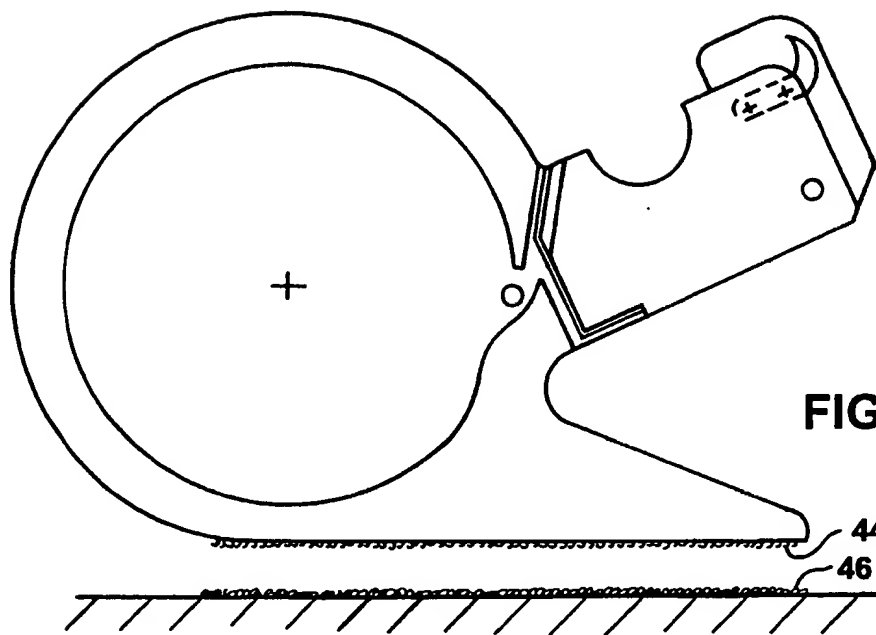


FIG. 6

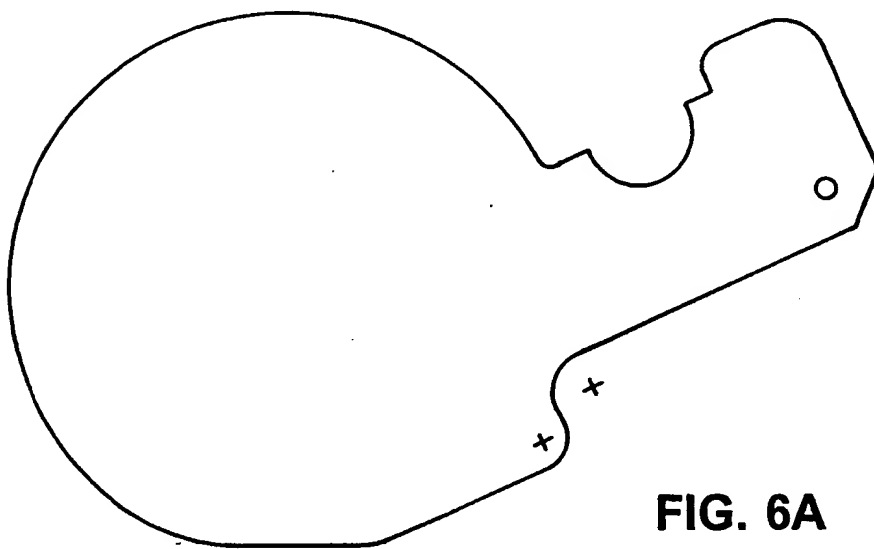


FIG. 6A



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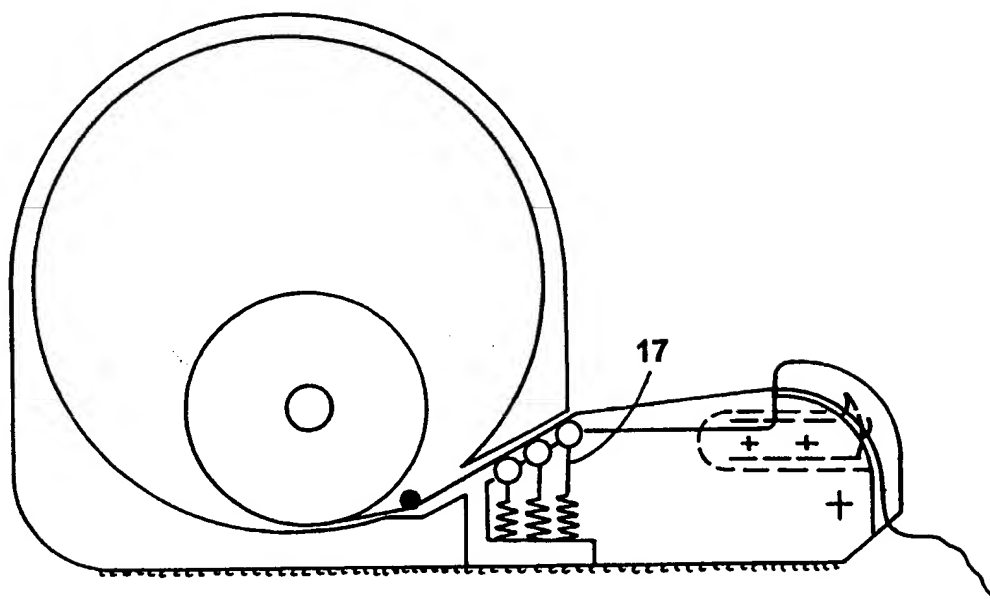
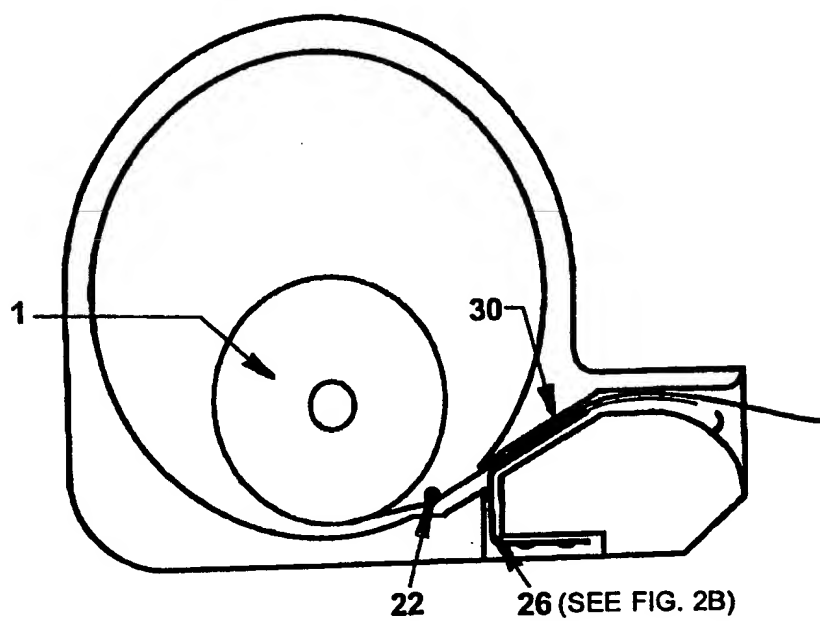


FIG. 6B

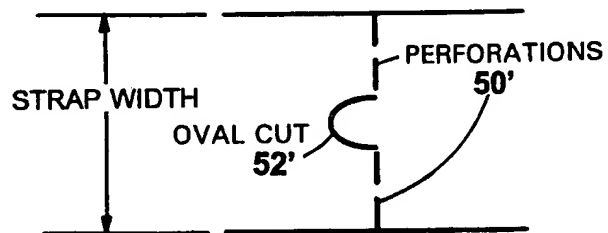
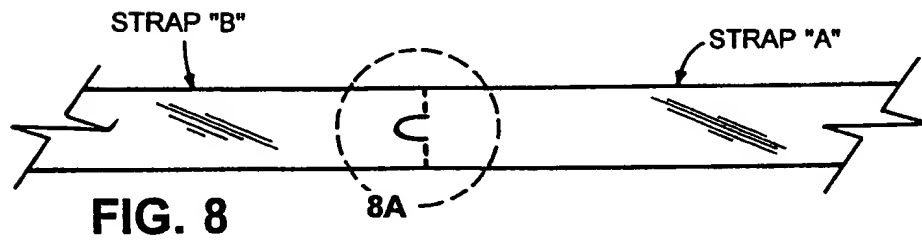
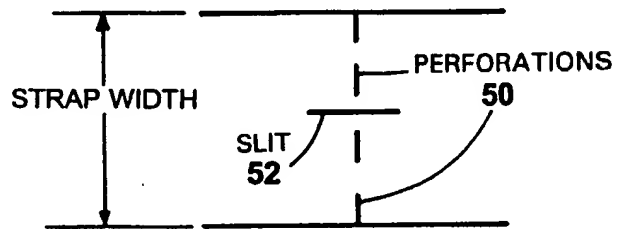
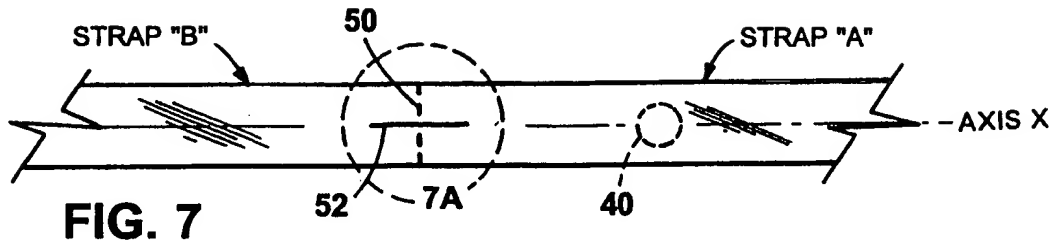
6/15



(COVER REMOVED FOR CLARITY)

**FIG. 6C**

7/15



8/15

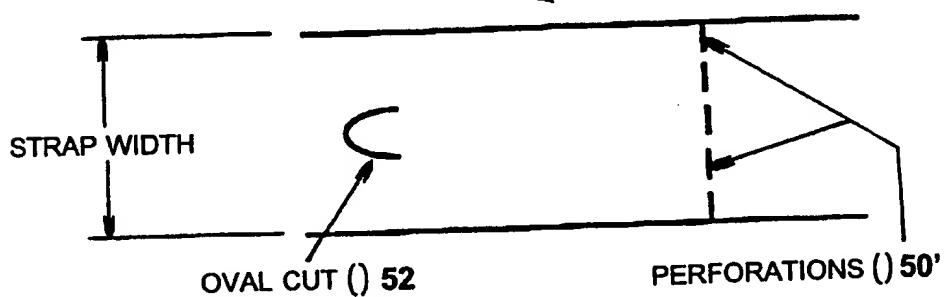
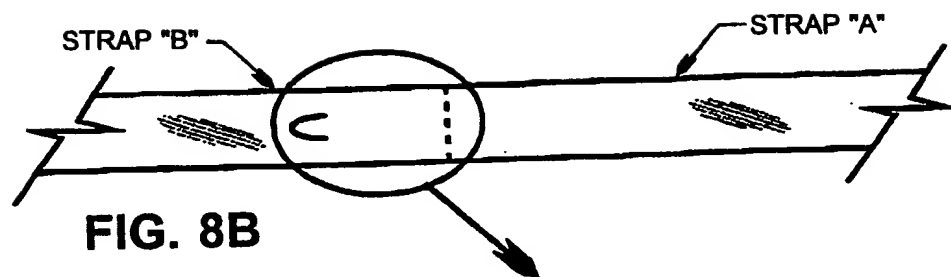
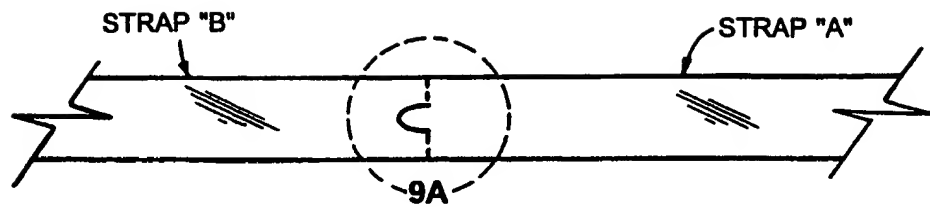
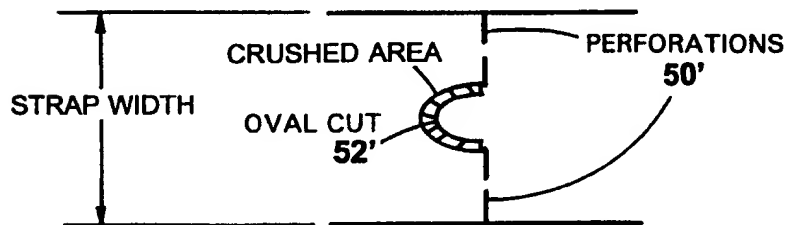


FIG. 8C

9/15.



**FIG. 9**



**FIG. 9A**

10/15

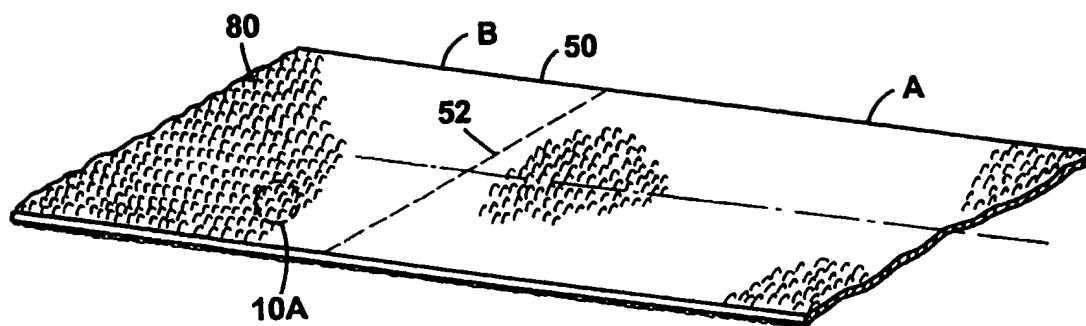


FIG. 10

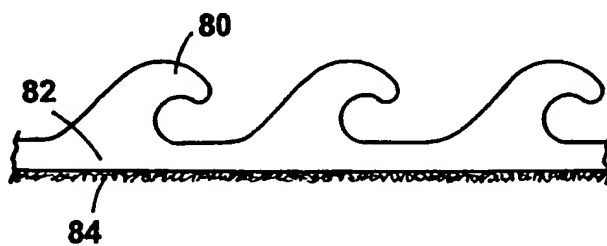
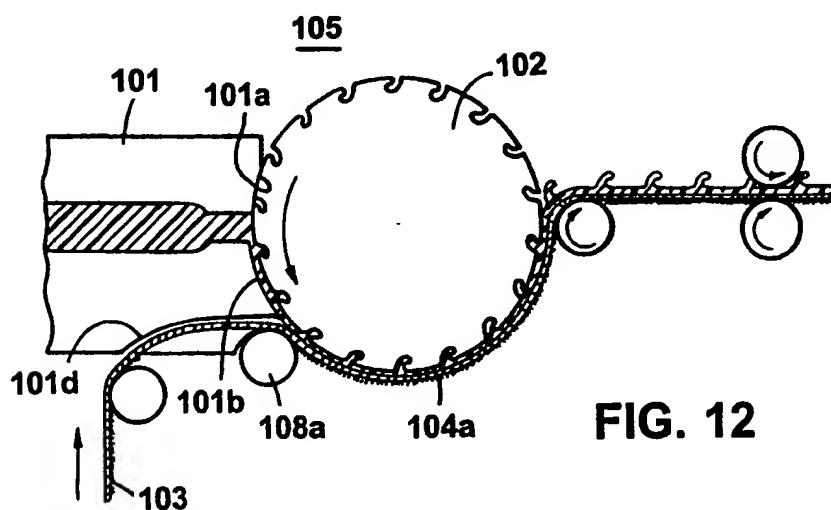
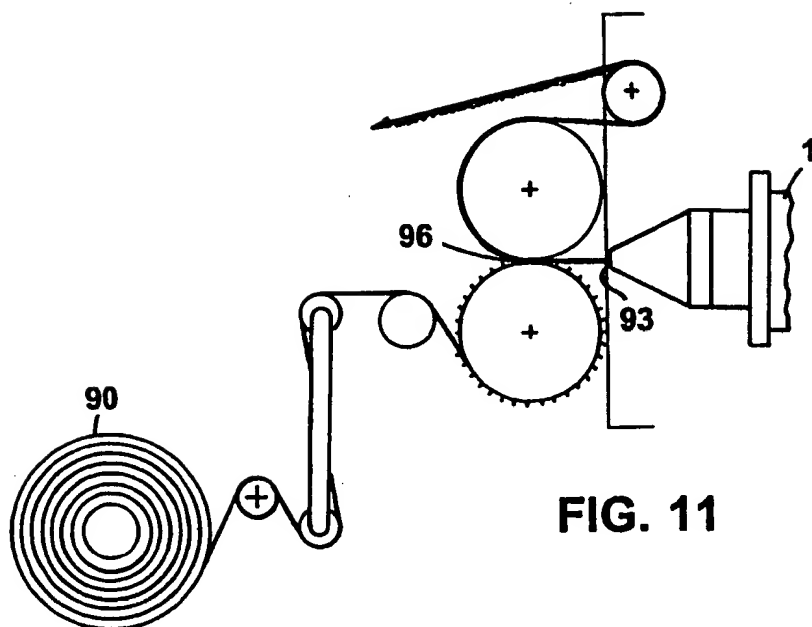
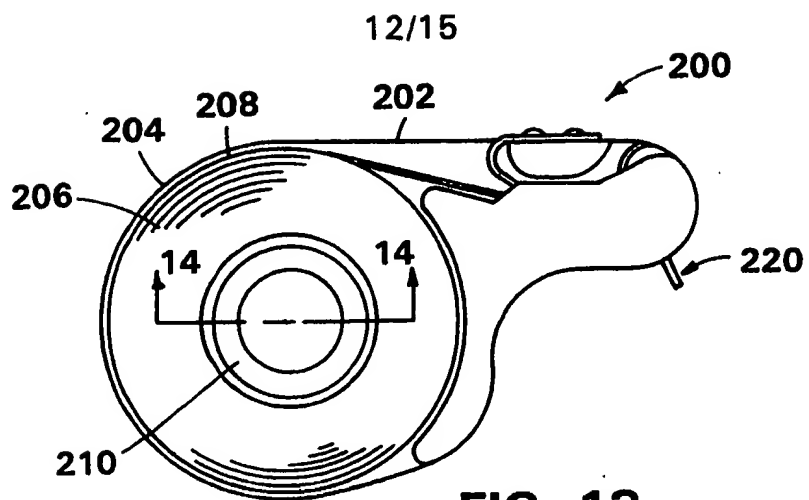


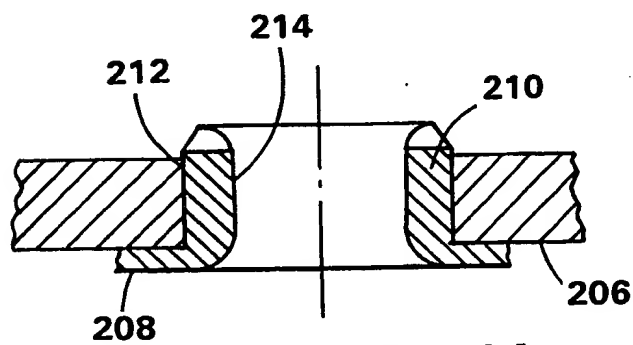
FIG. 10A

11/15

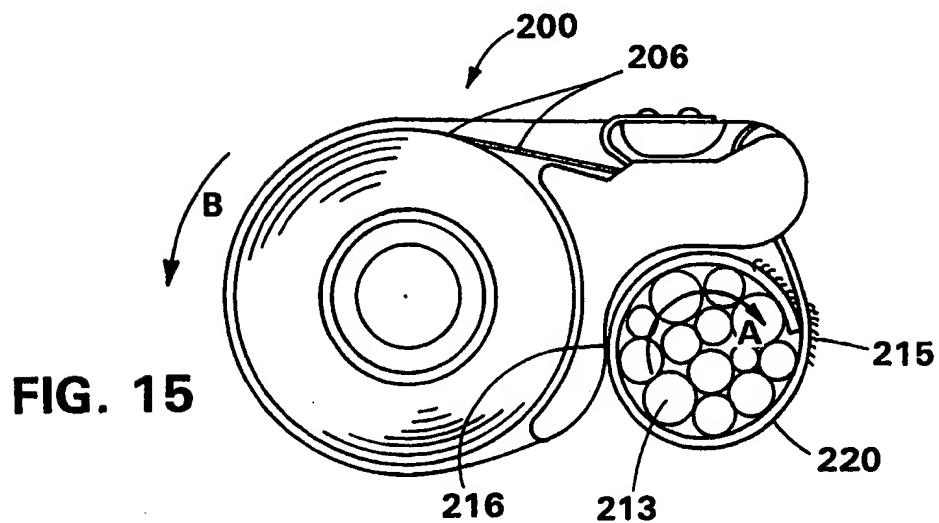




**FIG. 13**



**FIG. 14**



**FIG. 15**



13/15

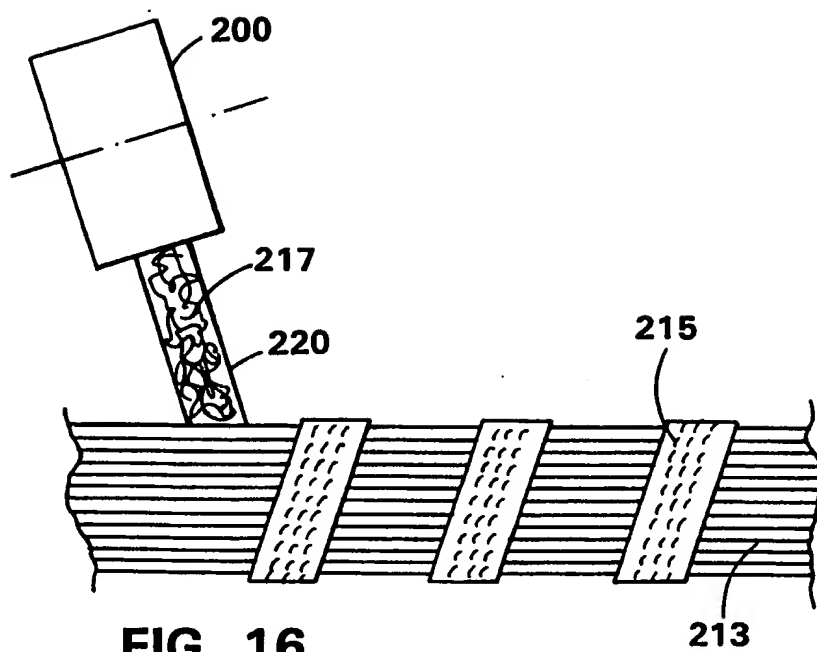


FIG. 16

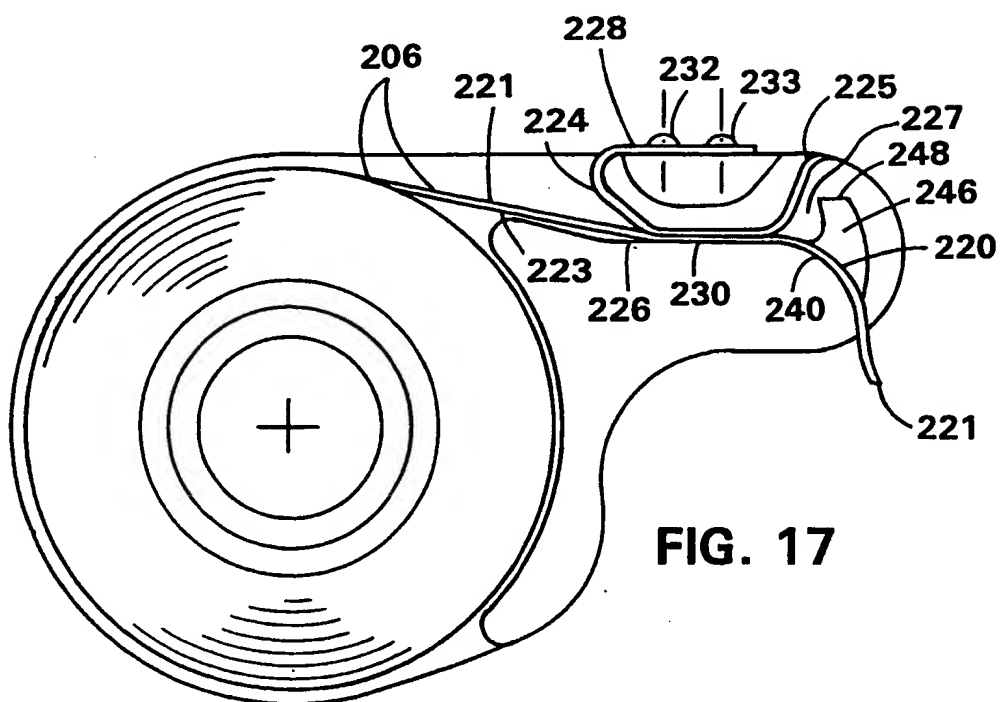


FIG. 17

14/15

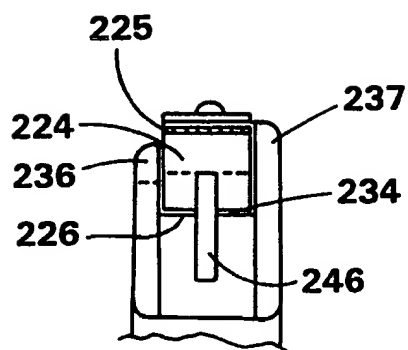


FIG. 18

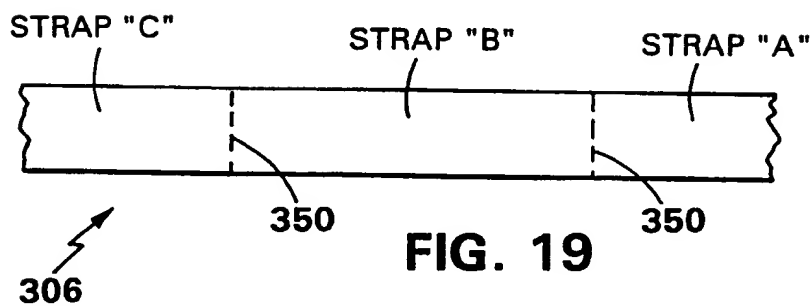


FIG. 19

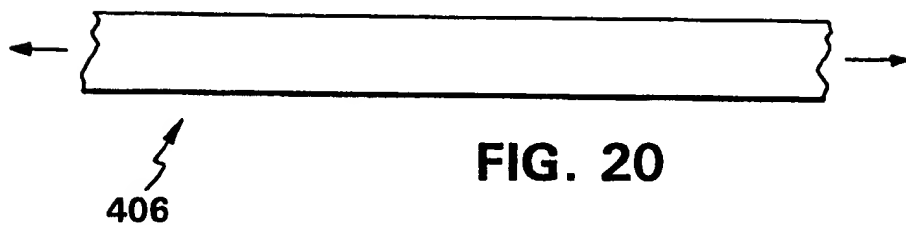


FIG. 20

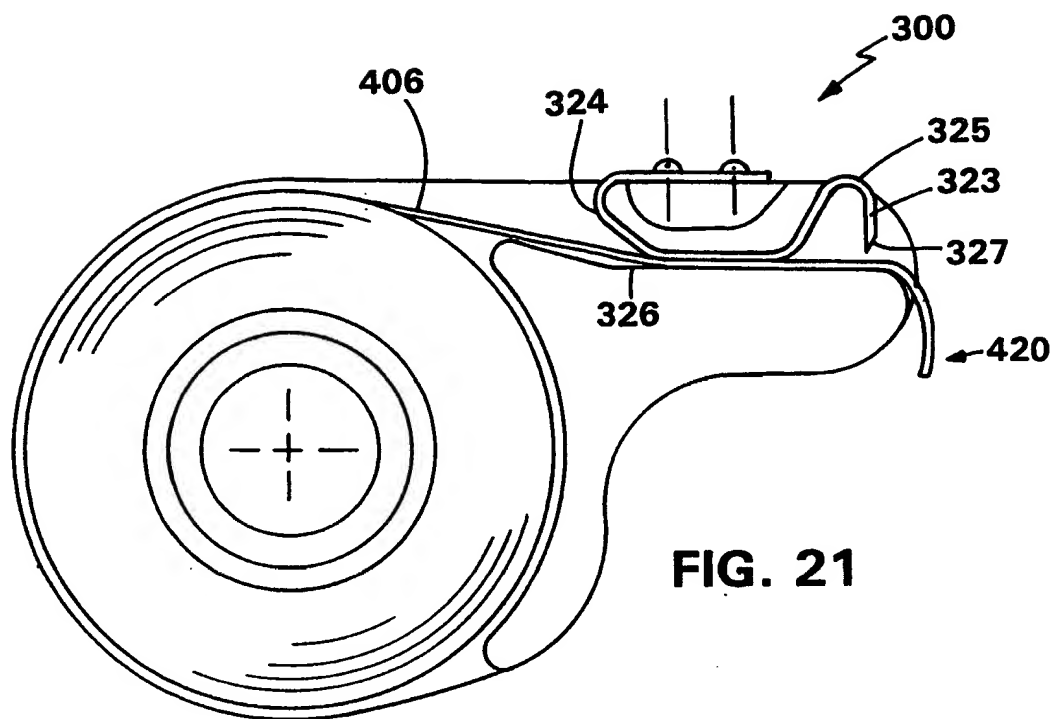


FIG. 21

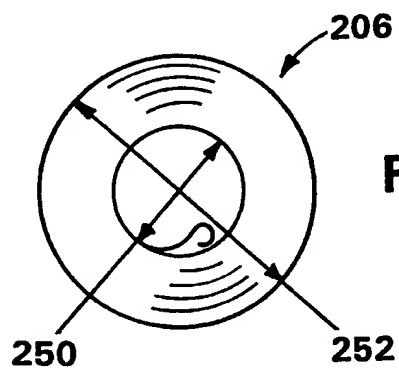


FIG. 22